**Identifying acids**

Some students are discussing what is distinctive about an acid.

**Molly:** Acids burn you.

**Tim:** Acids melt metals.

**Alesha:** Acids taste sharp like vinegar and lemon juice.

**Jerry:** Acids eat materials away.

**Phil:** Acids turn litmus indicator red.

1. Who do you agree with, and why?
2. How could you find out safely whether a solution is an acid?

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| Cards for  **Identifying acids** | **Tim:** Acids melt metals. |
| **Molly:** Acids burn you. | **Jerry:** Acids eat materials away. |
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*Chemistry > Big idea CSU: Substances and properties > Topic CSU3: Acids and alkalis > Key concept CSU3.1: pH scale*

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| **Diagnostic question** |
| **Identifying acids** |

**Overview**

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| Learning focus: | Acidic and alkaline solutions may be compared using the pH scale. |
| Observable learning outcome: | Describe how to find out, safely, whether a solution is an acid. |
| Question type: | talking heads |
| Key words: | acid |

**What does the research say?**

Driver (1994) reports research that suggests that students’ perceptions of acids arise from either their own sensory experiences, such as tasting vinegar or lemon juice, or from what they hear or read about in the media (for example acid rain, acid attacks or antacid tablets).

The two major conceptions found by Hand and Treagust (1989) were that ‘acids eat material away’ and ‘acids burn you’. This may be why some students were found to think that the only way to test for an acid is to find out if it eats something away.

**Ways to use this question**

This task is intended for discussion in pairs or small groups. It can be done as a pencil and paper exercise or projected onto a screen.

Students should read the statements and follow the instructions on either the worksheet or the PowerPoint. Listening in to the conversations of each group will often give you insights into how your students are thinking. Each member of a group should be able to report back to the class.

Feedback from each group can be used, with careful teacher questioning, to bring out a clear description or explanation of the science.

*Differentiation*

The quality of the discussions can be improved with a careful selection of groups; or by allocating specific roles to students in each group. For example, you may choose to select a student with strong prior knowledge as the scribe. They may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

NB in any class, small group discussions typically improve over time and a persistence with this strategy is often very successful in the medium to long term.

**Expected answers**

1. Phil is correct that litmus turns red in acids. Alesha is correct that vinegar and lemon juice taste sharp, but this cannot be generalised to all acids (which are unsafe to taste). Tim and Jerry show misunderstandings about the reaction of acids with other substances.

2. In a laboratory litmus may be used to find out whether a solution is acidic.

**How to respond - what next?**

Acids do not melt metals, but they do react with some to form a soluble product. This may make it look as if the metal disappears. However not all metals are reactive, so this is not a reliable way to test for an acid.

Acids do react with some materials (e.g. limestone) but not all. A soluble product is formed, which may give the impression that the material has been ‘eaten away’.

Misunderstandings about the reaction of acids with materials may be challenged using diagnostic questions and response activities from key concept CCR4.1: Neutralisation.

Any student who considers a sharp taste to be distinctive of an acid should be reminded that nothing should ever be tasted in a laboratory nor should an unknown liquid be tasted elsewhere. Although true that vinegar and lemon juice taste sharp this cannot safely be used as a way to find out whether a solution is acidic.

Diagnostic question “Naming alkalis” includes an opening question which could be used to check that students are confident in the use of litmus indicator to distinguish an acid from an alkali. The following BEST ‘response activity’ could be used as a follow-up to this:

* Response activity: Drain cleaner

**Acknowledgments**

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Images: None

**References**

Driver, R., et al. (1994). *Making Sense of Secondary Science: Research into Children's Ideas,* London, UK: Routledge.

Hand, B. and Treagust, D. F. (1989). Application of a conceptual conflict teaching strategy to enhance student learning of acids and bases. *Research in Science Education,* 19**,** 133-144.